UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Mr. Alan Pollock, Acting Director
Division of Water Quality Programs
Virginia Department of Environmental Quality
629 Main Street
Richmond, VA 23219

Dear Mr. Pollock:

The United States Environmental Protection Agency (EPA) Region III is pleased to approve the Total Maximum Daily Loads (TMDLs) for the primary contact use impairments within the Appomattox River Watershed. The TMDLs were submitted to EPA for review in April 2004. The TMDLs were established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address multiple water quality impairments as identified in Virginia's 1998 and 2002 Section 303(d) lists.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) designed to attain and maintain the applicable water quality standards, (2) include a total allowable loading and as appropriate, wasteload allocations (WLAs) for point sources and load allocations for nonpoint sources, (3) consider the impacts of background pollutant contributions, (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated), (5) consider seasonal variations, (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality), (7) consider reasonable assurance that the TMDL can be met, and (8) be subject to public participation. The enclosure to this letter describes how the TMDLs for the primary contact use impairments satisfy each of these requirements.

Following the approval of these TMDLs, Virginia shall incorporate the TMDLs into an appropriate Water Quality Management Plan pursuant to 40 CFR § 130.7(d)(2). As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please don't hesitate to contact Mr. Peter Gold at (215) 814-5236.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

Decision Rationale

**Total Maximum Daily Loads for
the Primary Contact Use (Bacteriological) Impairments in the
Appomattox River Watershed**

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for the primary contact use (bacteriological) impairments within the Appomattox River Watershed. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3) The TMDLs consider the impacts of background pollutant contributions.
4) The TMDLs consider critical environmental conditions.
5) The TMDLs consider seasonal environmental variations.
6) The TMDLs include a margin of safety.
7) There is reasonable assurance that the TMDLs can be met.
8) The TMDLs have been subject to public participation.

II. Background

The Falling River Watershed is located in Central Virginia, the watershed falls within the jurisdiction of several counties. There are nineteen bacteriologically impaired segments within the Appomattox River Watershed. These segments were identified as impaired by the Commonwealth of Virginia's Department of Environmental Quality (VADEQ) on the Commonwealth's Section 303(d) List. The Section 303(d) is a list which identifies the waters within the state that are failing to attain their applicable designated uses. Table 1 lists all of the impaired segments within the Appomattox River Watershed and the date of initial listing which are covered by this TMDL

Table 1 - List of Impaired Waters in the Appomattox River Watershed.

Stream Name	Segment Id	Initial Listing	Location
Spring Creek	VAC-J02R	1998	Mud Creek to Buffalo Creek (5.50 miles)
Briery Creek	VAC-J05R	1998	Briary Creek Lake Dam to Bush River (9.94 miles)
Bush River (1)	VAC-J04R	2002	Mountain Creek to limit of watershed (4.22 miles)
Little Sandy Creek	VAC-J03R	2002	Headwaters to the Sandy Reservoir (7.35 miles)
Bush River (2)	VAC-J03R	2002	Sandy River to mouth (0.78 miles)
Saylers Creek	VAC-J06R	1996	Headwaters to mouth (8.90 miles)
Angola Creek (1)	VAC-J06R	2002	Headwaters to Unnamed Tributary at Rt. 664 (4.59 miles)
Angola Creek (2)	VAC-J06R	2002	Unnamed Tributary at Rt 664 to mouth (2.56 miles)
Horsepen Creek	VAC-J06R	2002	Headwaters to Big Guinea Creek (3.82 miles)
Nibbs Creek	VAC-J09R	1998	Amelia Courthouse Sewage Treatment Plant to Flat Creek (5.28 miles)
Flat Creek	VAC-J08R	1996	Nibbs Creek to mouth (3.99 miles)
Appomattox River (1)	VAC-J01R	1996	Vaughans Creek to Deep Creek (2.13 miles)
West Creek	VAC-J11R	2002	Tanners Branch to Deep Creek (7.22 miles)
Deep Creek	VAC-J11R	1998	Cellars Creek to Beaverpond Creek (11.19 miles)
Appomattox River (2)	VAC-J15R	2002	Lake Chesdin Dam to Fall Line (7.44 miles)
Swift Creek (1)	VAC-J16R	1998	Turkey Creek to Swift Creek Reservoir (1.61 miles)
Swift Creek (2)	VAC-J17R	1998	Swift Creek Lake Dam to Licking Creek (7.09 miles)
Swift Creek (3)	VAC-J17R	2002	Lakeview Reservoir Dam to Timsbury Creek (4.00 miles)
Appomattox River (3)	VAC-J15R	1998	Entire Estuarine Segment (2.68 square miles)

In response to Section 303(d) of the CWA, VADEQ listed the above segments of the Appomattox River Watershed on Virginia's 1996, 1998 and/or 2002 Section 303(d) lists as being unable to attain their primary contact uses. The decisions to list these segments of the Appomattox River Watershed were based on observed violations of the Commonwealth's bacteriological criteria. At the time of listing, the bacteria criteria used fecal coliform as an indicator species and had an instantaneous standard 1,000 colony forming units (cfu) per 100 milliliters (ml) and geometric mean standard of 200 cfu/100 ml. Water quality samples collected from these waters during the assessment period violated this criteria greater than 10 percent of the time. There are waters within the watershed with impairments based on low dissolved oxygen concentrations and/or impaired biological communities, these waters and impairments were not addressed by the Appomattox River Watershed TMDL. This decision rationale will address the TMDLs for the impairments of the primary contact use.

Fecal coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Fecal coliform in itself is not a pathogenic organism. However, fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate the elevated likelihood of increased pathogenic organisms.

EPA encouraged the states to use e-coli and enterococci as the indicator species instead of fecal coliform. A better correlation was drawn between the concentrations of e-coli and enterococci, and the incidence of gastrointestinal illness. The Commonwealth adopted e-coli and enterococci criteria in January 2003. According to the new criteria, streams will be evaluated via the e-coli and enterococci criteria after 12 samples have been collected using these indicator species. Twelve e-coli samples were collected from the waters within the Appomattox River Watershed.

As Virginia designates all of its waters for primary contact, all waters are required to meet the bacteriological standard for primary contact. Virginia's standard applied to all streams designated as primary contact for all flows. The e-coli criteria requires a geometric mean concentration of 126 cfu/100 ml of water with no sample exceeding 235 cfu/100 ml of water. Unlike the new fecal coliform criteria, which allows a 10 percent violation rate, the new e-coli criteria requires the concentration of e-coli to not exceed 235 cfu/100 ml of water.

Although the TMDL and criteria require the 235 cfu/100 ml of water concentration limit not be exceeded, waters are not placed on the Section 303(d) list if their violation rate does not exceed 10 percent. Therefore, the impaired waters of the Appomattox River Watershed may be deemed as attaining their primary contact use prior to the implementation of all of the TMDL reductions. It is necessary to keep this in mind because of the reductions required to attain the instantaneous criteria for e-coli according to the model. Since the criteria apply both standards to the water and the instantaneous criteria must be met during all flows, high sporadically occurring violations can drive the model. A single violation of 23,500 cfu/100 ml would require the removal of 99 percent of the bacteria.

The TMDL submitted by Virginia is designed to determine the acceptable load of e-coli which can be delivered to the impaired waters, as demonstrated by the Hydrologic Simulation Program Fortran (HSPF)[1], in order to ensure that the water quality standard is attained and maintained. HSPF is considered an appropriate model to analyze the impaired watershed because of its dynamic ability to simulate both watershed loading and receiving water quality over a wide range of conditions. The model was run to determine the fecal coliform loading to the impaired waters and the loads were then converted to e-coli using a conversion factor established by the Commonwealth.

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[1]Bicknell, B.R., J.C. Imhoff, J.L. Little, and R.C. Johanson. 1993. Hydrologic Simulation Program-FORTRAN (HSPF): User's Manual for release 10.0. EPA 600/3-84-066. U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, GA.

The TMDL model allocates the application/deposition of fecal coliform to land based and instream sources. For land based sources, HSPF accounts for the buildup and washoff of pollutants from these areas. Buildup (accumulation) refers to all of the complex spectrum of dry-weather processes that deposit or remove (die-off) pollutants between storms.[2] Washoff is the removal of fecal coliform which occurs as a result of runoff associated with storm events. These two processes allow the model to determine the amount of fecal coliform from land based sources which is reaching the stream. Point sources and wastes deposited directly to the stream are treated as direct deposits. Wastes which are deposited directly to the stream do not need a transport mechanism.

Local rainfall and temperature data were needed to develop the model. Weather data provides the rainfall and temperature data which drive the TMDL model. Due to the size of the watershed and the lack of hourly rainfall data, multiple weather stations were used including National Climatic Data Center (NCDC) weather stations in Amelia (440187), Appomattox (440243), Buckingham (441136), Camp Pickett (441322), Charlotte Court House (1585), Farmville (442941), Hopewell(444101), Powhatan (446906), and Winterpock (449213). Hourly weather data was derived using a disaggregation scheme.

Stream flow data was available for Appomattox River, therefore, the hydrology model was calibrated to the observed flow collected at a United States Geological Survey (USGS) gages 02039000, 02039500 and 020400000. The calibration period for the model was from October 1993 through September 1998. During the calibration the model parameters were adjusted to allow the model to more accurately represent the observed data. When a satisfactory simulation was developed it was validated to a different data set of observed flow. The validation period for the model was from October 1988 through September 1993. During the validation the parameters were held constant to insure that the model accurately reflected the stream. The model replicated the observed gage data reasonably well during the calibration and validation.

The HSPF model was next set-up to predict the water quality in the impaired reaches of the Appomattox Watershed. The model was calibrated against water quality monitoring data collected from the many water quality stations within the Appomattox River Watershed from October 1998 through August 2003. The model was validated to data collected from October 1993 through September 1998.

Through the development of this and other similar TMDLs, it was discovered that natural conditions (wildlife contributions to the streams) could cause or contribute to violations of the bacteria criteria. Bacterial source tracking (BST) sampling data collected from the impaired segments of the Appomattox River demonstrated that bacteria from wildlife represents a significant portion of the total bacterial load. In some instances the loads from wildlife alone appear to violate the numeric criteria. Many of Virginia's TMDLs, including the TMDLs for the

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[2]CH2MHILL, 2000. Fecal Coliform TMDL Development for Cedar, Hall, Byers, and Hutton Creeks Virginia,

Appomattox River Watershed, have called for some reduction in the amount of wildlife contributions to the impacted streams. EPA believes that a significant reduction in wildlife is not practical and will not be necessary due to the implementation plan discussed below. It should be noted that in order for the impaired waters to be in compliance approximately 90 percent of the time, less stringent reductions are required from wildlife sources. This would be the violation rate necessary for the water to be assessed as attaining criteria for 303(d) listing purposes.

A phased implementation plan will be developed for all streams in which the TMDL calls for reductions in wildlife. In Phase 1 of the implementation, the Commonwealth will begin implementing the reductions (other than wildlife) called for in the TMDL. In Phase 2, which can occur concurrently to Phase 1, the Commonwealth will consider addressing its standards to accommodate this natural loading condition. The Commonwealth has indicated that during Phase 2, it may develop a Use Attainability Analysis (UAA) for streams with wildlife reductions which are not used for frequent bathing. Depending upon the result of the UAA, it is possible that these streams could be designated for secondary contact.

After the completion of Phase 1 of the implementation plan, the Commonwealth will monitor the stream to determine if the wildlife reductions are actually necessary, as the violation level associated with the wildlife loading may be smaller than the percent error of the model. In Phase 3, the Commonwealth will investigate the sampling data to determine if further load reductions are needed in order for these waters to attain standards. If the load reductions and/or the new application of standards allow the stream to attain standards, then no additional work is warranted. However, if standards are still not being attained after the implementation of Phases 1 and 2, further work and reductions will be warranted.

The TMDL was modeled using fecal coliform loading rates, as was done in previous TMDL efforts. The fecal coliform concentrations were then converted to e-coli concentrations using a translator equation developed by VADEQ. Significant reductions in the modeled load were required in order for the impaired waters within the Appomattox River Watershed to attain the new e-coli criteria in the model. Table 2 documents the TMDL load for each of the bacteriologically impaired segments.

Table 2 - Summarizes the Specific Elements of the TMDLs.

Segment	TMDL (cfu/yr)	WLA (cfu/yr)	LA (cfu/yr)	MOS
Angola Creek (1)	6.76E+12	0.00	6.76E+12	Implicit
Angola Creek (2)	1.80E+13	0.00	1.80E+13	Implicit
Appomattox River (1)	6.90E+14	4.74E+12	6.86E+14	Implicit
Appomattox River (2)	6.01E+14	1.07E+13	5.90E+14	Implicit
Appomattox River (3)	7.91E+14	6.87E+13	7.22E+14	Implicit
Briery Creek	3.84E+13	3.50E+09	3.84E+13	Implicit
Bush River (1)	9.03E+13	3.50E+09	9.03E+13	Implicit

Bush River (2)	1.10E+14	3.50E+09	1.10E+14	Implicit
Deep Creek	1.06E+14	8.71E+11	1.06E+14	Implicit
Flat Creek	8.80E+13	5.24E+11	8.75E+13	Implicit
Horsepen Creek	4.44E+12	0.00	4.44E+12	Implicit
Little Sandy Creek	1.62E+12	0.00	1.62E+12	Implicit
Nibbs Creek	1.29E+13	5.24E+11	1.23E+13	Implicit
Saylers Creek	1.40E+13	0.00	1.40E+13	Implicit
Spring Creek	2.08E+13	0.00	2.08E+13	Implicit
Swift Creek (1)	2.01E+13	8.37E+09	2.01E+13	Implicit
Swift Creek (2)	8.42E+13	3.07E+11	8.39E+13	Implicit
Swift Creek (3)	1.29E+14	4.59E+11	1.28E+14	Implicit
West Creek	3.91E+13	0.00	3.91E+13	Implicit

The United States Fish and Wildlife Service has been provided with copy of this TMDL.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing a primary contact (bacteriological) impairment TMDLs for the Appomattox Watershed. EPA is therefore approving these TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDLs are designed to meet the applicable water quality standards.

Virginia has indicated that excessive levels of fecal coliform due to nonpoint sources (both wet weather and directly deposited nonpoint sources) have caused violations of the water quality criteria and designated uses in the Appomattox Watershed. The water quality criterion for fecal coliform was a geometric mean 200 cfu/100 ml or an instantaneous standard of no more than 1,000 cfu/100 ml. Two or more samples over a 30 day period are required for the geometric mean standard. Since the state rarely collects more than one sample over a thirty-day period, most of the samples were measured against the instantaneous standard. The violation rate varied among the different subwatersheds from as low as 10 percent on Swift Creek to 100 percent on Angola Creek.

The Commonwealth has changed its bacteriological criteria as indicated above. The new e-coli criteria requires a geometric mean of 126 cfu/100 ml of water with no sample exceeding 235 cfu/100 ml. When the data is judged against the new criteria, the violation rate for most of the segments increase.

The HSPF model was used to determine the fecal coliform deposition rates to the land as

well as loadings to the stream from direct deposit sources. Once the existing load was determined allocations were assigned to each source category to develop a loading pattern that would allow the impaired waters within the Appomattox River Watershed to support the e-coli water quality criterion and primary contact use. The following discussion is intended to describe how controls on the loading of e-coli to the watershed will ensure that the criterion is attained.

The TMDL modelers determined the fecal coliform production rates within the watershed. Data used in the model was obtained from a wide array of sources, including farm practices in the area, the amount and concentration of farm animals, animal access to the stream, wildlife in the watershed, wildlife fecal production rates, septic system numbers and failure rates, pet populations, landuses, weather conditions, stream geometry, etc.. The model combined all of the data to determine the hydrology and water quality of the stream.

The lands within the watershed were categorized into specific landuses. The landuses had specific loading rates and characteristics that were defined by the modelers. Therefore, the loading rates are different in lands defined as forested versus pasture. Pasture lands support cattle and are influenced differently by stormwater runoff. The amount of cattle on the land, the time cattle spend on the land, and how much waste the cattle deposit impacts the loading rate.

Local rainfall and temperature data were needed to develop the model. Hourly weather data was ascertained through the transformation of daily average rainfall data from a compilation of NCDC weather stations. This data was used to determine the precipitation rates in the watershed which transports the on land pollutants to the streams through overland and groundwater flows. Waste that was deposited to the land was subjected to a die-off rate. The longer fecal coliform stayed on the ground the greater the die-off was. Materials that were washed off the surface shortly after deposition were subjected to less die-off.

Stream flow data was available for Appomattox River, therefore, the hydrology model was calibrated to the observed flow collected at a United States Geological Survey (USGS) gages 02039000, 02039500 and 020400000. The calibration period for the model was from October 1993 through September 1998. During the calibration the model parameters were adjusted to allow the model to more accurately represent the observed data. When a satisfactory simulation was developed it was validated to a different data set of observed flow. The validation period for the model was from October 1988 through September 1993. During the validation the parameters were held constant to insure that the model accurately reflected the stream. The model replicated the observed gage data reasonably well during the calibration and validation.

The HSPF model was next set-up to predict the water quality in the impaired reaches of the Appomattox Watershed. The model was calibrated against water quality monitoring data collected from the many water quality stations within the Appomattox River Watershed from October 1998 through August 2003. The model was validated to data collected from October 1993 through September 1998. The TMDL modelers adjusted the loading rates from the various land uses and direct deposit sources to determine what reductions were required to meet the applicable water quality criteria. It was determined that in addition to almost the complete

removal of anthropogenic sources, a significant reduction was needed from land based and direct deposit inputs from wildlife for almost all of the impaired segments.

2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 2 of this document. The total allowable load is calculated on an annual basis.

Waste Load Allocations

There are 27 facilities within the Appomattox River Watershed that are permitted to discharge into the stream. Four of these permits regulate stormwater discharge the remaining 23 of these are traditional dischargers. The WLA of the 23 traditional dischargers can be determined by multiplying their design flow by the bacterial concentration allowed in their discharge by 365 after the appropriate unit conversions. All of these facilities are allowed to discharge effluent with an e-coli concentration of 126 cfu/100 ml, which is the water quality criteria for e-coli. These facilities can not cause a violation of the criteria if they are discharging at or below the criteria. The facilities are in all likelihood discharging below this concentration. Table 3 documents the WLAs for the Appomattox River Watershed.

EPA regulations require that an approvable TMDL include individual waste load allocations (WLAs) for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

Table 3 - WLAs for the Appomattox River Watershed

Facility	Permit Number	WLA (cfu/yr)
Single Family Unit	VAG402047	1.75E+09
Single Family Unit	VAG404002	1.75E+09
Single Family Unit	VAG404107	1.75E+09
Single Family Unit	VAG404129	1.75E+09
Single Family Unit	VAG404140	1.75E+09

Single Family Unit	VAG404161	1.75E+09
Single Family Unit	VAG407199	1.75E+09
Single Family Unit	VAG407198	1.75E+09
Single Family Unit	VAG404092	1.75E+09
Farmville Waste Water Treatment Plant (WWTP)	VA0083135	4.18E+12
Amelia County Sanitary District	VA0086681	5.24E+11
Chesterfield Co. Grange Elementary WWTP	VA0020222	1.15E+10
Crewe WWTP	VA0020303	8.71E+11
DOC Dinwiddie Field Unit 27 WWTP	VA0023540	2.62E+10
Appomattox River Water Authority	VA0005819	4.70E+12
South Central Wastewater Authority	VA0025437	4.01E+13
Red Hill Mobile Home Park WWTP	VA0028258	6.81E+10
US Army Fort Lee Aerial Delivery Site	VA0059161	8.73E+11
Swift Creek Water Treatment Plant	VA0006254	1.05E+10
DOC Pocahontas Correctional Unit 13	VA0023426	9.59E+10
Thomas Dale West Sewage Treatment Plant (STP)	VA0020206	1.67E+10
Children's Home of VA Baptist Lagoon	VA0027561	1.75E+10
New Matoaca High School	VA0090344	6.99E+10
Chesterfield (Stormwater)	VA0088609	1.14E+13
Colonial Heights (Stormwater)	VAR040009	2.49E+12
Hopewell (Stormwater)	VAR040015	1.44E+12
Petersburg (Stormwater)	VAR040013	1.76E+12

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), load allocations (LAs) are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings, VADEQ used the HSPF model to represent the impaired watershed. The HSPF model is a comprehensive modeling system for the simulation of watershed hydrology, point and nonpoint source loadings, and receiving water quality. HSPF uses precipitation data for continuous and storm event simulation to determine total loading to the impaired segments from the various landuses within the watershed. The TMDL allocated the loadings to specific landuses such as commercial, residential, pasture, cropland, barren and woodlands. In order to meet the applicable criteria at least a 90 percent reduction was needed from all anthropogenic sources. Reductions were also required from wildlife deposits on forested lands and within the stream. Tables 4a through 4t document the allocated loads of fecal coliform for each segment.

Table 4a - Load Allocations to Bush Run (1)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	2.50E+10	99
Commercial	1.89E+10	99
Cropland	3.71E+13	99
Pasture	1.78E+13	99
Potential	5.89E+11	99

Residential	7.48E+11	99
Wetlands	7.38E+13	88
Woodlands	1.58E+14	88
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	2.63E+13	0

Table 4b - Load Allocations to Little Sandy Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.29E+10	99

Commercial	3.82E+09	99
Cropland	1.41E+13	99
Pasture	5.97E+12	99
Potential	1.88E+11	99
Residential	5.94E+10	99
Wetlands	7.97E+13	99
Woodlands	2.00E+14	99
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100

Wildlife Direct Deposit	4.15E+12	48

Table 4c- Load Allocations to Brush Run (2)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	5.40E+10	99
Commercial	1.62E+10	99
Cropland	3.74E+13	99
Pasture	7.96E+12	99
Potential	2.62E+11	99
Residential	4.35E+11	99

Wetlands	4.41E+13	88
Woodlands	6.31E+13	88
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	1.74E+13	35

Table 4d - Load Allocations for Saylers Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.06E+10	99
Commercial	1.42E+09	99

Cropland	1.56E+13	99
Pasture	1.38E+13	99
Potential	5.62E+11	99
Residential	3.91E+11	99
Wetlands	2.83E+13	80
Woodlands	7.52E+13	80
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	7.33E+12	55

Table 4e- Load Allocations for Angola Creek (1)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.90E+09	99
Commercial	1.19E+08	99
Cropland	5.22E+11	99
Pasture	1.20E+13	99
Potential	2.46E+11	99
Residential	7.16E+10	99
Wetlands	3.70E+12	90
Woodlands	2.24E+13	90

Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	2.96E+12	50

Table 4f - Load Allocations for Angola Creek (2)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	9.49E+09	99
Commercial	1.25E+08	99
Cropland	2.02E+13	99
Pasture	9.71E+12	99

Potential	3.82E+11	99
Residential	5.07E+10	99
Wetlands	4.90E+12	95
Woodlands	5.29E+12	95
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	7.43E+12	0

Table 4g - Load Allocations for Horsepen Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction

Barren	4.46E+09	99
Commercial	0.00	99
Cropland	1.03E+13	99
Pasture	4.12E+12	99
Potential	1.29E+11	99
Residential	5.42E+10	99
Wetlands	2.47E+11	99
Woodlands	1.37E+12	99
Straight Pipes	0.00	100

Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	9.42E+11	62

Table 4h - Load Allocations for Nibbs Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	0.00	100
Commercial	0.00	100
Cropland	0.00	100
Pasture	0.00	100
Potential	0.00	100

Residential	0.00	100
Wetlands	3.36E+13	70
Woodlands	1.43E+14	70
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	1.58E+13	20

Table 4i - Load Allocations for Flat Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.20E+11	99

Commercial	3.23E+10	99
Cropland	1.03E+14	99
Pasture	8.66E+13	99
Potential	1.82E+12	99
Residential	1.35E+12	99
Wetlands	1.67E+14	80
Woodlands	4.89E+14	80
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100

Wildlife Direct Deposit	4.58E+13	51

Table 4j - Load Allocations for Appomattox River (1a)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	4.04E+11	99
Commercial	2.21E+11	99
Cropland	1.23E+14	99
Livestock	5.33E+12	99
Pasture	1.20E+14	99
Residential	5.59E+12	99

Wetlands	2.71E+14	80
Woodlands	1.27E+15	80
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	2.09E+14	0

Table 4k - Load Allocations for Appomattox River (1b)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.94E+11	99
Commercial	9.36E+09	99

Cropland	1.49E+14	99
Pasture	1.08E+14	99
Potential	2.91E+12	99
Residential	3.13E+12	99
Wetlands	5.21E+14	69
Woodlands	1.21E+15	69
Straight Pipes	0.00	100
Livestock Direct Deposit	7.62E+12	93
Wildlife Direct Deposit	1.46E+14	0

Table 4l - Load Allocations for Appomattox (1c)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	1.32E+11	99
Commercial	1.45E+11	99
Cropland	1.62E+13	99
Pasture	1.34E+13	99
Potential	5.28E+11	99
Residential	8.16E+11	99
Wetlands	1.57E+13	52
Woodlands	1.31E+15	52

Straight Pipes	0.00	100
Livestock Direct Deposit	1.32E+13	0
Wildlife Direct Deposit	6.04E+13	0

Table 4m - Load Allocations for West Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	4.23E+10	99
Commercial	6.57E+09	99
Cropland	3.21E+13	99
Pasture	1.43E+13	99

Potential	5.75E+11	99
Residential	5.29E+11	99
Wetlands	4.21E+13	89
Woodlands	1.25E+14	89
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	1.79E+13	62

Table 4n - Load Allocations for Deep Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction

Barren	2.14E+11	99
Commercial	2.48E+11	99
Cropland	1.11E+14	99
Pasture	6.27E+13	99
Potential	2.76E+12	99
Residential	2.07E+12	99
Wetlands	2.40E+13	95
Woodlands	1.85E+14	95
Straight Pipes	0.00	100

Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	3.13E+13	70

Table 4o - Load Allocations for Appomattox River (2)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	9.38E+11	96
Commercial	5.83E+12	96
Cropland	8.26E+14	96
Pasture	3.03E+14	96
Potential	1.25E+13	96

Residential	3.05E+13	96
Wetlands	4.25E+13	0
Woodlands	5.32E+15	0
Straight Pipes	0.00	100
Livestock Direct Deposit	1.18E+14	0
Wildlife Direct Deposit	1.41E+14	0

Table 4p - Load Allocations for Swift Creek (1)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	2.22E+09	99

Commercial	1.74E+10	99
Cropland	2.08E+11	99
Pasture	5.16E+10	99
Potential	1.59E+12	99
Residential	8.62E+11	99
Wetlands	7.51E+12	74
Woodlands	2.87E+14	74
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100

Wildlife Direct Deposit	9.84E+12	51

Table 4q - Load Allocations for Swift Creek (2)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	4.26E+10	99
Commercial	2.19E+11	99
Cropland	5.10E+11	99
Livestock	1.04E+11	99
Pasture	2.79E+12	99
Residential	1.01E+13	99

Wetlands	5.45E+12	53
Woodlands	8.59E+14	53
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	3.32E+13	33

Table 4r - Load Allocations for Swift Creek (3)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	5.65E+10	99
Commercial	1.61E+11	99

Cropland	4.10E+11	99
Livestock	1.14E+11	99
Pasture	3.93E+12	99
Residential	3.50E+12	99
Wetlands	1.98E+13	59
Woodlands	6.58E+14	59
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	3.08E+13	25

Table 4s - Load Allocations for Appomattox River (3)

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	2.52E+11	99
Commercial	1.58E+12	99
Cropland	9.54E+11	99
Pasture	2.37E+12	99
Potential	8.10E+10	99
Residential	1.01E+13	99
Wetlands	1.80E+14	80
Woodlands	3.67E+14	80

Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	7.22E+13	10

Table 4t - Load Allocations for Spring Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction
Barren	2.36E+10	99
Commercial	5.32E+09	99
Cropland	1.04E+11	99
Livestock	5.13E+11	99

Pasture	9.44E+12	99
Residential	2.88E+11	99
Wetlands	5.21E+13	70
Woodlands	1.63E+14	70
Straight Pipes	0.00	100
Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	2.23E+13	33

Table 4u - Load Allocations for Briery Creek

Land Use	Allocated Load (cfu/yr)	Percent Reduction

Barren	3.17E+10	99
Commercial	7.76E+09	99
Cropland	3.97E+10	99
Pasture	5.78E+12	99
Potential	3.16E+11	99
Residential	9.40E+11	99
Wetlands	6.37E+13	78
Woodlands	1.92E+14	78
Straight Pipes	0.00	100

Livestock Direct Deposit	0.00	100
Wildlife Direct Deposit	1.86E+13	33

3) The TMDLs consider the impacts of background pollution.

The TMDL considers the impact of background pollutants by considering the bacteria load from background sources like wildlife.

4) The TMDLs consider critical environmental conditions.

According to EPA's regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the Appomattox Watershed is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[3]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

The HSPF model was run over a multi-year period to insure that it accounted for a wide range of climatic conditions. The allocations developed in the TMDL will therefore insure that the criteria is attained over a wide range of environmental conditions including wet and dry weather conditions.

5) The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic

[3]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods.

Bacteria loadings also change during the year based on crop cycles, waste application rates, and cattle access patterns. Consistent with our discussion regarding critical conditions, the HSPF model and TMDL analysis effectively considered seasonal environmental variations through the use of observed weather data over an extended period of time and by modifying waste application rates, crop cycles, and livestock practices.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia included an implicit MOS in the TMDL through the use of conservative modeling assumptions in the determination of bacteria loadings and production.

7) There is a reasonable assurance that the TMDLs can be met.

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program.

8) The TMDLs have been subject to public participation.

There were six public meetings held for the TMDL, three for the Upper Appomattox Watershed and three for the Lower Appomattox Watershed. The three public meetings for the Upper Appomattox Watershed were held ion May 20, 2003, November 4, 2003, and March 4, 2003, 58 and 36 people attended the last two meetings respectively. The first two meetings were held in Hampden-Sydney Virginia and the last meeting was held in Farmville, Virginia. The meetings were noticed in the Virginia Register and Farmville Herald.

The meetings for the Lower Appomattox Watershed were held on May 21, 2003, November 6, 2003 and March 11, 2003. All three meetings were held in municipal buildings in Chesterfield, Virginia and between 13 and 19 people attended the meetings. The meetings were noticed in the Virginia Register and several local paper. VADEQ responded to written comments associated with both watersheds.